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III.

STUDIES FROM THE NEWPORT MARINE LABORATORY.

XXI. — A PRELIMINARY ACCOUNT OF THE DEVELOPMENT AND HISTOLOGY OF THE EYES IN THE LOBSTER.

By G. H. Parker.

Presented by Alexander Agassiz, October 10, 1888.

The following is a brief statement of the results obtained from studying the development and histology of the eyes in lobsters. The method in which the optic nerve appears to terminate is so exceptional, that, before making a final publication on this subject, it seems desirable to seek confirmation in the structure of the eyes in other Crustacea. As this will delay the appearance of the paper, and since in other directions definite conclusions have been reached, it seems advisable to publish now an account of my present conclusions.

The first indication of the optic apparatus in the young lobster is a pair of ectodermic thickenings on either side, and slightly in front of where the mouth is to appear. The superficial part of each of these thickenings gives rise to the retina, and the deep part to the optic ganglion. The ganglionic portion is cut off from the retinal portion by the ingrowth of the basement membrane. In certain regions, however, the basement membrane does not cut the connection between the retina and ganglion. These primitive connections persist in the adult as optic nerve fibres.

In the eye of an adult lobster each ommatidium consists of at least sixteen cells. Directly under each corneal facet are found two flat lentigenous cells (corneal hypodermis). Under these are four retinophoræ, one for each angle of the corneal facet. The retinophoræ are extremely elongated, and extend from the deep face of the corneal hypodermis to the basement membrane. From the corneal hypodermis to the spindle the four retinophoræ are closely applied to one another. At the distal end of the spindle they separate, passing around that structure as fibres. As they approach the basement membrane they converge slightly, and terminate on the retinal surface of that membrane. Under the centre of each ommatidium the basement membrane is considerably thickened, and it is on this thickening that the four retinophoræ terminate.

Each ommatidium has ten pigment cells, — two distal and eight proximal. The distal cells surround the retinophoræ in the region of the crystalline cones, and from this region they are continued inward as fibres till they pass through the basement membrane. The eight proximal pigment cells are closely applied to the spindle, the fibres of the four retinophoræ passing between them. Seven of these are deeply pigmented; one is without pigment. The eight cells extend only a short distance in front of the spindle; the seven pigment cells proper are continued inward as large fibres *through the basement membrane.* In addition to the sixteen cells just described, each ommatidium has two or three irregular cells filled with a pigment, brownish by transmitted, white by reflected light. These cells envelop the proximal half of the spindle, and extend to the basement membrane. The spindles themselves do not reach the basement membrane.

The sixteen cells already described are ectodermic in origin. The two or three additional cells may be from either an ectodermic or mesodermic source, but the evidence thus far gathered points decidedly to their ectodermic origin.

The basement membrane, as was previously mentioned, has a thickening in it under each ommatidium. Around a given thickening there are four openings through the membrane. Each opening, however, is placed between two thickenings, so that in reality only half of each cluster of four openings belongs to a given thickening. There are two classes of openings, one with a single small and four large fibres, and another with one small and three large fibres, passing through. Each thickening has two of each class accompanying it. Of the fourteen large and four small fibres passing through the four openings, only one half, or seven large and two small fibres, belong to a given ommatidium. These represent the seven deep and two superficial pigment cells. After passing through the basement membrane, these fibrous ends of the pigment cells thicken considerably, and, having grouped themselves in bundles, pass inward, constantly diminishing in calibre, till they reach the optic ganglion. The optic nerve between the retina and first optic ganglion is composed of these fibres bound together by a small amount of connective tissue. All attempts at isolating any other form of fibres have failed, and it would therefore seem that the fibres of the optic nerve terminate in these nine pigment cells.